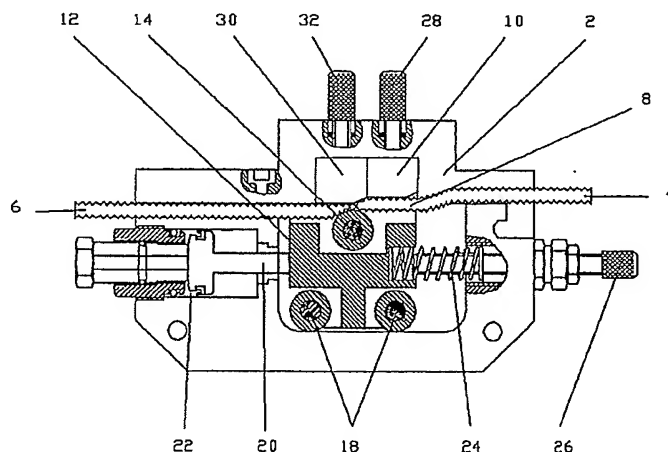




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(21) International Application Number: PCT/DK93/00038 (22) International Filing Date: 4 February 1993 (04.02.93) (30) Priority data: 0138/92 5 February 1992 (05.02.92) DK (71)(72) Applicant and Inventor: PÅLSSON, Allan, Kenneth [DK/DK]; Ringbjergvej 31, DK-4682 Tureby (DK). (81) Designated States: AU, CA, FI, JP, NO, US, European pa- tent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).		Published <i>With international search report.</i> <i>With amended claims.</i>

(54) Title: VALVE WITH REDUCED PRESSURE DROP ESPECIALLY FOR VISCOUS OR CORROSIVE LIQUIDS

**(57) Abstract**

A valve comprising a housing (2) with an inlet (4) and an outlet (6) and between the inlet and outlet a conduit (8) providing passage through the valve, which conduit is closed at a flexible closing section, the closing section consists of a flexible tubing (9), forming at least a part of conduit (8); a seat (10) supports the flexible tubing (9); and a closing member (12) being axially displaceable to the seat (10) and arranged adjacent to conduit (8) at the diametrically opposite side to seat (10), so that flexible tubing (9) by axially displacement of closing member (12) towards seat (10) is squeezed partly or completely between seat (10) and closing member (12) to control or shut off passage of a fluid stream through the valve.

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VALVE WITH REDUCED PRESSURE DROP ESPECIALLY
FOR VISCOUS OR CORROSIVE LIQUIDS

The present invention relates to a valve comprising a housing with an inlet and outlet end and there between a conduit providing passage through the housing and having a flexible closing section.

5 A valve of the above type is the known membrane valve, wherein a rubber membrane arranged in the conduit is compressed mechanically by an actuator or pressurized air against the bottom of the conduit and thereby shuts off passage through the conduit.

10 Compared to conventional seat valves, wherein a fluid stream through the valve is strongly deflected during passage between the core and seat causing considerable pressure drop, pressure drop is significant reduced in the membrane valve.

15 Due to reduced pressure drop and the simple construction of the membrane valve, this valve is commonly used for viscous or corrosive liquids.

20 The major drawback of the known membrane valves is the limited durability of the rubber membrane, which by frequent opening and closure of the valve loses flexibility and has, thus, frequently been changed.

An object of this invention is to provide a valve having a flexible closing section without the drawback of the known valves of this type.

25 The valve of the invention comprises a housing with an inlet and an outlet and there between a conduit providing passage through the valve, which conduit being closed in a flexible closing section, which section consists of a flexible tubing in at least a part of the conduit;

a seat supporting the flexible tubing; and

30 a closing member axially displaceable towards the seat and arranged adjacent to the conduit on the diametrical opposite site to the seat, so that the flexible tubing on axially displacement of the closing member towards the

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seat completely or partly squeezes the tubing against the seat to control or shut off a fluid stream through the conduit and the valve.

5 The valve according to the invention is, in particular, useful in the control of a stream of viscous or corrosive liquids or powders, because the stream has no contact to complicated parts of the valve, which may be damaged upon passage of such stream through the valve.

10 In the most simple embodiment of the inventive valve, the conduit is provided by a flexible tube being part of an external piping.

The tube runs through the housing via its inlet and outlet. A fluid stream is controlled by the closing member, which in form of a rectangular body may be moved by an actuator along the tube towards the seat. The seat in form of a rectangular body supports a portion of the tube on the side being diametrically opposite to the closing member.

15 The edges of the closing member and the seat adjacent to the tube are in line and axially displaced at open position of the valve, so that the edges upon closure of the valve squeeze the tube between them.

20 The closing member slides parallel with the tube and/or the conduit on a sliding bar, which prevents radial displacement of the member during movement towards the seat.

25 The tube or conduit is at open valve position slightly deflected in that part of the tube or conduit which is between the closing member and the seat.

30 In a further embodiment of the invention this deflection of the tube or conduit is avoided by arranging the sliding bar within the housing with an inclined direction towards the seat, so that the closing member is detached from the tube or conduit at open valve position. The closing member is, thereby, moved in an inclined direction towards the conduit or tube and the seat during

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closure of the valve. Such an embodiment is, in particular, useful for dosage or control of a stream of highly viscous liquids or pressurized liquids, whereby pressure drop caused by the deflection of the conduit or tube is desirably diminished.

In a preferred embodiment of the invention the inclination of the sliding bar is adjustable by action of e.g. a screw extending into the valve housing, whereby the closing member moving towards the seat adjustable reduces passage through the conduit.

In further a preferred embodiment of the invention the closing member is moved by action of an actuator being activated by a pneumatic cylinder installed on the valve housing at the outlet, so that the member is moved axially along the conduit towards the seat arranged at the inlet side of the housing, whereby the flexible tubing is compressed against and along the seat in a direction towards the inlet side. This results in lower pressure at the outlet of the conduit, which pressure is sufficiently low to suck a portion of a fluid backwards in the conduit.

Drip off from the conduit at the outlet during closure of the valve is, thereby, prevented, which is important for precise dosage of liquids by aid of the valve.

The valve according to the invention is, thus, useful for the dosage of a fluid from a pressurized container or a pump.

The invention will be described in greater detail with reference to the drawings in which:

Fig. 1 is a sectional view of a valve according to a specific embodiment of the invention; and

Fig. 2 is a sectional view similar to that of Fig. 1, but showing the valve at closed position.

The valve shown in Fig. 1 and 2, consists of valve housing 2 with inlet 4 and outlet 6. Flow passage through the valve is provided by conduit 8 between inlet 4 and

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outlet 6. Conduit 8 may be a flexible tubing being part of an external piping from a container or a pump (not shown) and running through housing 2. Alternatively, conduit 8 may be composed of a metal tube and a flexible tubing section at outlet 6, resting on seat 10. The flexible tubing may be made from a gas and liquid tight plastic material. A closing member 12 is arranged axially displaceable adjacent to conduit 8 on the side being diametrically opposite to seat 10. Member 12 rests via pinching cylinder 14 on conduit 8 and moves on sliding bar 16.

At open valve position (Fig. 1), closing member 12 is in an axially displaced position to seat 10, so that the edge of pinching cylinder 14 resting on conduit 18 is substantially in line with the edge of seat 10 being adjacent to conduit 8.

At the position of sliding bar 16 shown in Fig. 1, the bar is parallel to conduit 8, which in the region of the closing member is in form of a V to allow passage through the valve.

The position of the bar may be adjusted upwards at the outlet side of housing 2 and downwards at the inlet side by action of screw 28.

At this bar position closing member 12 allows passage through the conduit without deflection around closing member 12, which moves in an inclined direction towards conduit 8 and seat 10 during closure of the valve.

Closing member 12 is activated via actuator 20 by pneumatic cylinder 22, which is arranged at the outlet side of housing 2. Upon pressurizing cylinder 22 actuator 20 pushes member 12 on sliding bar 16 axially towards the inlet side and against mechanical stop 26 being in form of an adjustable screw 28. Screw 28 is surrounded by coil spring 24, which on one side abuts upon the valve housing and at the other side upon closing member 12. During movement of member 12 towards the inlet side pinching cylinder 14 compresses conduit 8 against seat 10, and passage

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through the conduit is shut off, as shown in Fig. 2. Depending on the adjustment of mechanical stop 26, conduit 8 is squeezed for a distance along seat 10, whereby there is generated low pressure in conduit 8 at outlet 6 and a portion of a fluid in the conduit is sucked backwards in the conduit.

Upon depressurizing of pneumatic cylinder 22 closing member 12 is pushed backwards by coil spring 24 towards its starting position at open valve position, as shown in Fig. 1.

To reduce sliding friction during movement of the closing member on the sliding bar, the member slides by two or more wheels 18 on the bar.

For the throttling of a fluid stream through the valve, there may further be installed a throttle plate 30, which at open valve position can restrict passage through the conduit by partly compressing the conduit against pinching cylinder 14. Throttling can be adjusted by screwing adjustment screw 32 towards plate 30.

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CLAIMS

1. A valve comprising a housing (2) with an inlet (4) and an outlet (6) and between the inlet and outlet a conduit (8) providing passage through the valve, which conduit is closed at a flexible closing section, **characterized in that** the closing section consists of a flexible tubing (9), forming at least a part of conduit (8);
a seat (10) supports the flexible tubing (9); and
10 a closing member (12) being axially displaceable to the seat (10) and arranged adjacent to conduit (8) at the diametrically opposite side to seat (10), so that flexible tubing (9) by axially displacement of closing member (12) towards seat (10) is squeezed partly or completely between
15 seat (10) and closing member (12) to control or shut off passage of a fluid stream through the valve.
2. The valve of claim 1, **characterized in that** conduit (8) is in form of a flexible tubing, which is part of an external piping.
- 20 3. The valve of claim 1, **characterized in that** closing member (12) is moveable arranged on a sliding bar (16), which prevents radial displacement of member (12).
4. The valve of claim 1, **characterized in that** the closing member (12) is provided with a pinching cylinder
25 (19) adjacent to conduit (8).
5. The valve of claim 1, **characterized in that** flexible tubing (9) is further supported by a throttle plate (30), adapted to press tubing (9) against closing member (12) at open valve position, so that tubing (9) is compressed for throttling a fluid stream through the valve.
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6. The valve according to anyone of the preceding claims, characterized in that closing member (12) is moved by an actuator (20) which is activated by a pneumatic cylinder (22) arranged at outlet (6), so that member (12) is displaced axially along conduit (8) towards seat (10) arranged at the outlet (4), and flexible tubing (9) is squeezed along seat (10) in direction towards inlet (4).

AMENDED CLAIMS

[received by the International Bureau on 2 July 1993 (02.07.93);
original claim 3 cancelled; original claim 1 amended;
claims 2,4,5 and 6 unchanged but renumbered as claims 2-5;
other claims unchanged (2 pages)]

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1. A valve comprising a housing (2) with an inlet (4) and an outlet (6) and between the inlet and outlet a conduit (8) providing passage through the valve, which conduit
10 is closed at a flexible closing section, consisting of a flexible tubing (9), and forming at least a part of conduit (8);

a seat (10) supporting the flexible tubing (9); and
a closing member (12) being axially displaceable to
15 the seat (10) and arranged adjacent to conduit (8) at the diametrically opposite side to seat (10), characterized in that closing member (12) is moveable arranged on a sliding bar (16) being arranged within housing (2) with an inclined direction towards seat (10), so that closing member (12) is
20 detached from tubing (9) at open valve position and closing member (12) moves with an inclined direction towards seat (10) during closure of the valve, and so that flexible tubing (9) by displacement of closing member (12) towards seat (10) is squeezed partly or completely between seat
25 (10) and closing member (12) to control or shut off passage of a fluid stream through the valve.

2. The valve of claim 1, characterized in that conduit (8) is in form of a flexible tubing, which is part of an
30 external piping.

3. The valve of claim 1, characterized in that the closing member (12) is provided with a pinching cylinder (19) adjacent to conduit (8).

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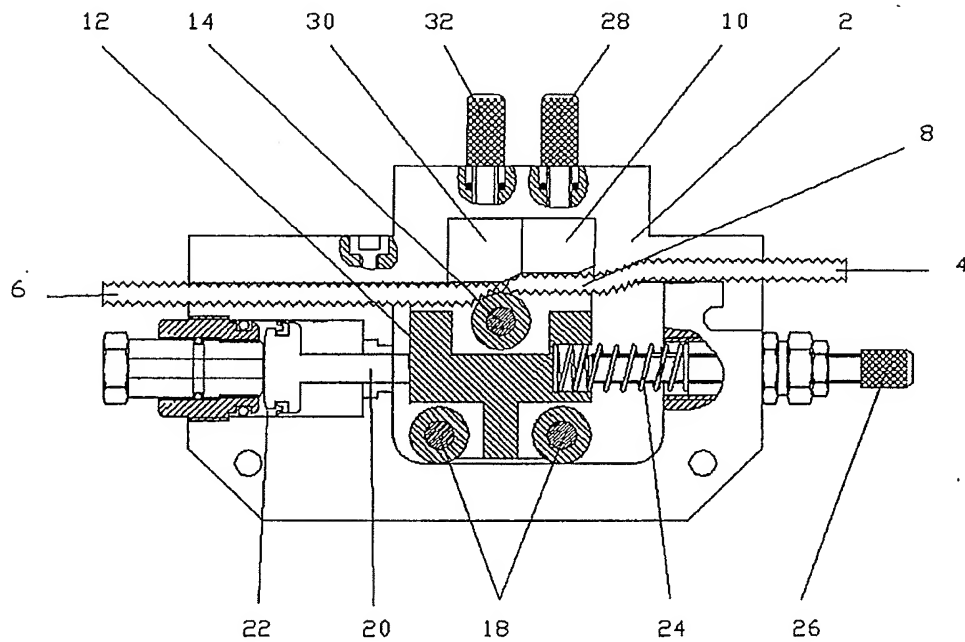
4. The valve of claim 1, characterized in that flexible tubing (9) is further supported by a throttle plate (30), adapted to press tubing (9) against closing member (12) at open valve position, so that tubing (9) is compressed for throttling a fluid stream through the valve.
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5 5. The valve according to anyone of the preceding
claims, characterized in that closing member (12) is moved
by an actuator (20), which is activated by a pneumatic
cylinder (22) arranged at outlet (6), so that member (12)
is displaced axially along conduit (8) towards seat (10)
10 arranged at the outlet (4), and flexible tubing (9) is
squeezed along seat (10) in direction towards inlet (4).

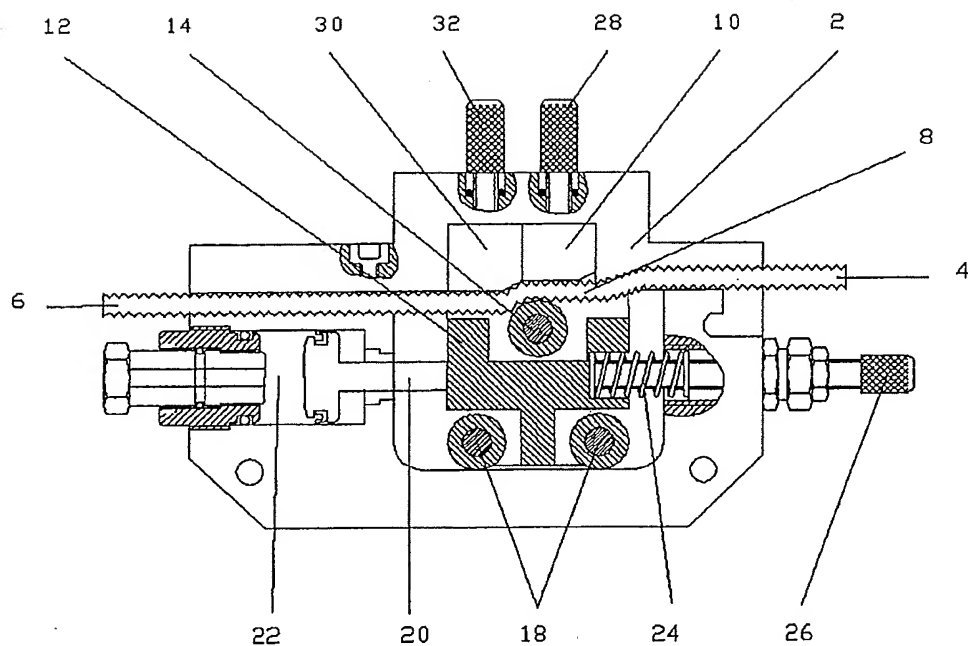
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FIGUR 1.



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FIGUR 2.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 93/00038

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: F16K 7/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: F16K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4436277 (ROBACK ET AL), 13 March 1984 (13.03.84), column 2, line 25 - line 34, figures 1, 3	5

X	US, A, 4403764 (REPPLINGER), 13 Sept 1983 (13.09.83), figures 21,22,23	1-4,6
Y	column 5, line 8 - line 60, abstract	5

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

31/03/93

International application No.

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US-A-	4436277	13/03/84	NONE	
US-A-	4403764	13/09/83	NONE	